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University of New Hampshire NEASC self-study report 2003. Part 2: The area reports. Creating a culture of undergraduate research

University of New Hampshire. Undergraduate Experience Committee. Subcommittee on Undergraduate Research

Creating a Culture of Undergraduate Research

Description and Appraisal. It is difficult to establish a definitive description of undergraduate research, given the variety of ways in which academic researchers and scholars engage in research within their respective disciplines, and the ways in which undergraduates may participate in scholarly and research activities. The following definition was used in the recent Survey of Engagement in Undergraduate Research sent to faculty and will also apply for this report:

> The faculty mentor is working directly with the student on research (as defined by the discipline). The faculty mentor may supervise and guide the student's own research topic/project, or may collaborate with the student on work directly related to the faculty mentor's own research. Undergraduate research may take place in a course, through independent studies, honors theses, senior projects, or in activities for which no academic credit is given. The student's research experience should meet these criteria: a) involves undergraduates first-hand in scholarship or research as it is designed, carried out, and shared within the discipline; b) involves undergraduates in scholarly/research skills that are not excessively repetitive or menial in nature; and c) enables undergraduates to begin to act as members of the discipline in accordance with its expectations for scholarship or research

There are five categories of opportunities for undergraduate research at UNH: 1) credit-bearing courses (including independent studies, research methods courses, senior projects, advanced courses in major); 2) Honors Program theses (also credit-bearing); 3) projects funded by the Undergraduate Research Opportunities Program (UROP) and the International Research Opportunities Program (IROP) (may include honors theses, senior projects); 4) projects funded by faculty grants; 5) research done on a volunteer basis (no credit, no remuneration). Of these five categories, accurate figures on the number of participants are available only for Honors Program students and UROP and IROP-funded students. No attempt has ever been made to determine the number of students participating in all categories.

Departments vary widely in the type and extent of research opportunities available to undergraduates. Some departments have long histories of encouraging undergraduate research (e.g., psychology, chemistry, biological sciences). Some have formalized requirements for their majors, including research methods courses (e.g., sociology, history, psychology, nursing, biochemistry) and/or a capstone experience or senior project (e.g., mechanical engineering, humanities program, dual major in international affairs). There is no university-wide requirement and the precise nature of the research project or capstone experience and expectations of performance are determined by the respective departments.

Given their centrality to undergraduate research, it is important to address the Honors Program, the Undergraduate Research Opportunities Program, and the

International Research Opportunities Program. The Honors Program was created in 1985 to offer an enriched undergraduate education to outstanding students and to encourage talented New Hampshire high school students to consider attending their state university. Approximately 12% of the first-year class participates in the program. All students completing any of the degree options in the Honors Program must complete a thesis. In the 19 years since the Program began, over 1300 students have graduated. Graduates of the Program cite their general education seminars and, especially, the challenge of writing a thesis as positive experiences that prepared them well for graduate education and/or the workplace. Designing a research plan and seeing it through under the guidance of a faculty mentor and, perhaps, presenting findings to an educated audience clearly benefit those students who are willing to expend the effort. Further efforts are needed to increase these opportunities for all students.

UNH made an institutional commitment to encourage undergraduate research with the creation of the Undergraduate Research Opportunities Program in 1987. From the outset, UROP was a university-wide program, with its own operating budget, dedicated to encouraging undergraduate research in all fields of study. The program develops important research skills, including proposal design and preparation, budget management, compliance with ethical conduct in research, collaboration with faculty, and public research presentation. While it evolved out of a need to ensure support for honors theses students, UROP has always been open to all university students and, in particular, has attempted to encourage students from disciplines that do not typically participate in undergraduate research. Since its inception UROP has supported over 1200 students. UROP offers three types of support: Undergraduate Research Awards, Summer Undergraduate Research Fellowships (USA & Abroad) and Research Presentation Grants. Students often use the Undergraduate Research Awards (expense awards & stipends) to conduct research during the academic year. The SURF grants enable students to pursue a project for ten weeks full time during the summer. Research Presentation Grants have supported students to present their research at regional, national, and international conferences.

Table XX: Total Awards by Type, 1987-2002

Type of Award		
	1987-94	1995-2002
Undergraduate Research Awards	383	335
Summer Undergraduate Research Fellowship	107	236
Research Presentation Grants	52	121

The International Research Opportunities Program (IROP) began with a three-year grant (1997-2000) from the U.S. Department of Education's Fund for the Improvement of Post-Secondary Education (FIPSE) and institutional matching funds. Currently supported with UNH funds, IROP offers a few well-qualified undergraduates opportunities for advanced research in an international setting, allowing students to collaborate with both UNH faculty members and foreign research mentors. In addition to

promoting research skills, IROP adds the challenge of integrating international experience with academic development. Students who successfully meet this challenge count their newly assertive global awareness and profoundly enhanced self-reliance among their many rewards. The first group of IROP students traveled abroad in the summer of 1999. From that time, a total of 35 students have participated, traveling to 23 different countries, representing 23 different UNH departments and 5 different colleges. In the upcoming summer of 2003, the fifth active year of the program, 7 additional IROP students will pursue their research in Australia, Bulgaria, England, Italy, Sweden, and Tanzania.

In addition to these three programs that have begun to foster a culture of research at UNH, the University has reinforced the importance of students presenting their research by sponsoring a university-wide Undergraduate Research Conference, now in its fourth year. In 2003 the conference will be a week-long event of activities celebrating the quality and breadth of research, creative presentations, and scholarly work undertaken by UNH undergraduates. The College of Life Sciences and Agriculture has sponsored a conference for its students since 1991, and the Psychology Department has offered its own conference since 1987. Other individual departments have offered venues for presentation of student work (research, scholarship, creative and performing activities). Each fall IROP sponsors a symposium during which the IROP students present their research and cultural experiences of the previous summer.

Finally, the University Library is a vital resource for undergraduate research. The library supports both undergraduate coursework and research in a variety of ways. Over the past ten years, the number of electronic information resources available to students remotely—from dormitory rooms, offices, homes, and computer clusters—has increased greatly. Digital books and journals, datasets, catalogs, and databases provide researchers with information at any time of day from any location. The renovation of the Dimond Library, the main library facility, not only improved the physical facility but greatly increased access to electronic resources for those students not owning a personal computer; over 120 workstations are available throughout the University Library. Recognizing the increasing complexity of research and the growing number of electronic resources, the Library has endeavored to provide a variety of options for instruction and assistance for undergraduates.

The UNH Academic Plan, 2002-2007 calls for the University to "provide undergraduate students an innovative, high quality, coherent and integrated education experience," and specifically urges that undergraduate research, along with experiential learning, service learning, community-based initiatives, internships, international study, and the Honors Program be "more integral to the academic experience." Integration is perhaps the greatest area of concern for undergraduate research as a central part of the university's academic mission. A recent content analysis of all undergraduate course descriptions indicates that approximately 250-270 courses appear to make an explicit attempt to address how research is conducted in the discipline, teach research techniques or methodology, or allow students to engage is original research. Only 8-9% of these courses, however, are offered at the lower division level; the remaining courses are upper

division and principally for majors. Thus achieving a more systematic and coherent introduction of lower division students to research across the university will be a major curricular challenge.

As selective, competitive programs, Honors, UROP, and IROP have served a special student clientele. UROP and IROP student evaluations and alumni surveys offer extensive anecdotal information on the variety of ways in which students benefit from their undergraduate research experience. In the Honors Program the quality of thesis work and the success of graduates, as reported on exit questionnaires and at the Honors alumni website, give ample testimony to the integral and successful relationship between UROP/IROP and the Honors Program and the important role that completion of the honors theses has played in the students' perceptions of the value of their undergraduate education. However, to meet the goals of the Academic Plan, these programs must work to develop ways in which the positive learning experiences associated with undergraduate research can have a broader reach across the student population and be more systematically integrated into the undergraduate curriculum. Steps to achieving broader impact will include new courses designed to familiarize students with research early in their undergraduate careers as part of an effort to create a series of graduated steps in exposure to research and research skills as students move through their undergraduate programs. The adoption of a fully articulated Discovery curriculum featuring a first-year seminar and a senior project will contribute to a more purposeful, consistent, and coherent undergraduate experience. (Specific recommendations aimed at integration and coherence appear in the "Projections" section.)

While there are multiple opportunities for undergraduate research and it is clearly valued by the institution, one key concern is the uneven participation across programs and the schools and colleges. There has been a steady growth in the number of students who complete the Honors Program, for instance, but the participation is not consistent across the university. Some departments have fully articulated programs while others have languished. This is a prime topic of discussion in the recent external review of the University Honors Program and will be discussed with the colleges during the spring semester of 2003. Like the Honors Program, UROP and IROP have noted an uneven rate of participation among the various departments and colleges. Following national trends in undergraduate research, the biological and physical sciences and engineering have been the most active, along with the social sciences. The traditional challenge of all undergraduate research programs has been to increase participation by the liberal arts, specifically the humanities. At least two factors are likely contributors to these disparities. First, there remains a tendency to equate "research" with "science" – this despite UROP/IROP efforts to counter this perception; students (and perhaps faculty) may, at least on first blush, view UROP as a program for "science types." Second, the incentives for mentoring are more apparent in at least some areas of scientific inquiry than they are in the humanities, while the potential disincentives are fewer. Many COLSA and social science UROP students are participants in ongoing research projects. They are often urged to apply to UROP by faculty mentors who not only recognize the educational benefits of participation in UROP but also value the laboratory or field assistance to be gained. In addition, because their research is going on whether or not a

UROP student participates, and is in many cases funded by grant money, they are probably less likely than faculty from other disciplines to feel that their UROP-related activities will go unrecognized (and uncompensated). Humanities faculty members, on the other hand, are more likely to be asked to serve as mentors for truly independent, student-initiated projects; in those cases, the issue of faculty incentives (see below) may be particularly important.

In the disciplines represented by the School of Health and Human Services, the need to meet the certification requirements of external professional organizations and major requirements to gain clinical experience allow less time for students to participate in undergraduate research. Yet the nursing program has been one of the most active, both in Honors and in UROP, and several students from this college have participated in IROP. As shown by the figures below, WSBE represents by far the lowest participation in UROP and IROP. One might conclude that students in the areas of business and management might prefer to seek practical on-the-job experience rather than pursue undergraduate research.

Participation by College in UROP, 1987-2002:

COLSA:	42%
COLA:	27%
CEPS:	19%
SHHS:	9%
WSBE:	2%
UNHM:	1%

Please note that the number of enrolled students varies considerably by college and by year. However, COLA usually represents about 40% of the total undergraduate population.

In addition to contributing to the noted cross-discipline differences, the issue of faculty incentives is also critical to the overall success of undergraduate research. Faculty who have served as UROP mentors comment on the rewards of working with motivated students and helping to shape their intellectual lives. Still, mentoring takes time and may have to be wedged into an already busy academic schedule. There is no specific monetary reward for faculty participation in UROP, and as noted above, the SURF faculty stipend has never been increased since 1987. More importantly, there is no formal mechanism for "counting" mentoring activities in the faculty workload or in promotion and tenure decisions. The challenge of providing appropriate recognition for faculty participation is one faced by the growing number of universities and colleges that, like UNH, recognize the critical role of undergraduate research. In the aforementioned Survey of Engagement in Undergraduate Research, 48 of 57 respondents (19 department chairs and 38 other faculty members) noted "insufficient time" as an obstacle to engagement, and 35 respondents suggested faculty incentives/recognition for mentoring as a means of increasing engagement in undergraduate research.

Projections. Our goal at UNH is not merely to *offer* undergraduate research opportunities but to create a *culture* of undergraduate research on campus. Recognition of the benefits of undergraduate research has grown in recent years. The successes of UROP, IROP, and Honors Program students have been well-publicized, on- and off-campus. Students and faculty mentors alike testify to the value of participation in these programs. The University's newly finalized Academic Plan for 2002-2007 reflects a strong commitment to providing even more undergraduate research opportunities and acknowledges not only their educational value but also their role in the recruitment of motivated students and the maintenance of a high-quality intellectual environment. There are important challenges as we continue to create the culture of undergraduate research to which we aspire.

Recommendation. Undergraduate Research is heavily dependent upon faculty supervision and one-on-one mentoring. To preserve and strengthen this faculty responsibility, faculty mentoring must be appropriately recognized and rewarded. This involves, at a minimum, mention in P&T Guidelines; inclusion of work with undergraduates on research as part of teaching and research responsibilities rather than as part of "service;" specific formula to count mentoring as part of faculty workload; public recognition for such work; and encouragement of mentoring through workshops for junior faculty and graduate students by senior faculty.

Recommendation. Undergraduate Research should be more clearly integrated in the undergraduate curriculum. Better integration will provide some relief to the time commitment of one-on-one mentoring of individual students and the expense of funding individual student projects. Moreover, integration has its own intrinsic merits and should be guided by two fundamental objectives: 1) to introduce students to the research skills, methodology, and scholarly and creative practices of the respective disciplines, and 2) to offer students more opportunities to participate directly in research and scholarly and creative activities following the model of professionals within their fields of study.

Recommendation. Pay particular attention to the ways in which RCM may affect the ability to enhance undergraduate research in the ways articulated in this self-study. There is a perception that the implementation of RCM has created a centrifugal effect on the flow of funds away from the Office of Academic Affairs and to the colleges. To the extent that this is the case, this undermines the ability of UROP, IROP, Honors, and the other academic support programs that are housed in Academic Affairs, to carry out their work. The implementation of the recommendations in this report, as well as the goals of the Academic Plan, will depend on the college deans assuming a leadership role in this endeavor and on a reward structure across disciplines that recognizes the value of engagement in undergraduate research. The balance of RCM principles with academic principles that require collaboration across RCM units needs to be addressed.